Assignment no. 8 Title: Greedy

## Problem:

You are given a set of intervals, each representing a job that needs to be done. Each job has a start time and an end time. You can only do one job at a time. What is the maximum number of jobs that you can do?

Here's an example to illustrate the algorithm:

Intervals: [1, 3], [2, 5], [3, 8], [4, 9], [5, 10], [6, 11], [7, 12], [8, 13], [9, 14], [10, 15]

Selected intervals: [1, 3], [4, 9], [10, 15]

The algorithm selects the interval [1, 3] first since it has the earliest end time. Then, it selects the interval [4, 9] because it does not overlap with the previously selected interval. Finally, it selects the interval [10, 15] because it also does not overlap with the previously selected intervals. This yields a maximum of 3 non-overlapping intervals.

## Solution:

This is a classic problem known as the "Interval Scheduling Problem". A greedy algorithm that can solve this problem is as follows:

- 1. Sort the intervals by their end times in ascending order.
- 2. Select the interval with the earliest end time.
- 3. For each remaining interval, if its start time is later than the end time of the previously selected interval, select it and update the end time.
- 4. Repeat step 3 until all intervals have been processed.

The algorithm selects the interval with the earliest end time first because it provides the maximum amount of time for the remaining intervals. The algorithm continues to select intervals that don't overlap with the previously selected intervals, which ensures that the maximum number of non-overlapping intervals is selected.

Here's an example to illustrate the algorithm:

Intervals: [1, 3], [2, 5], [3, 8], [4, 9], [5, 10], [6, 11], [7, 12], [8, 13], [9, 14], [10, 15]

Sorted by end times: [1, 3], [2, 5], [3, 8], [4, 9], [5, 10], [6, 11], [7, 12], [8, 13], [9, 14], [10, 15]

Selected intervals: [1, 3], [4, 9], [10, 15]

The algorithm selects the interval [1, 3] first since it has the earliest end time. Then, it selects the interval [4, 9] because it does not overlap with the previously selected interval. Finally, it selects the interval [10, 15] because it also does not overlap with the previously selected intervals. This yields a maximum of 3 non-overlapping intervals.